

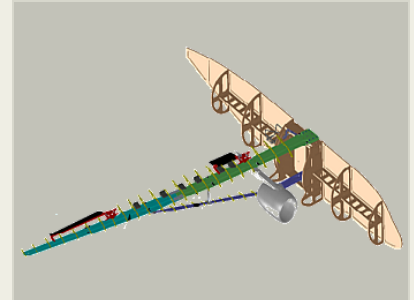
Innovative Structural and Material Concepts for Low-Weight Low- Drag Aircraft Design, Phase II

Completed Technology Project (2014 - 2016)



Project Introduction

The overall technical objective of this multi-phase project is to develop and validate a so-called 'AAW-Process' that consists of (i) the Active Aeroelastic Wing (AAW) technology of employing multiple control surfaces in tandem for achieving loads alleviation and drag minimization using the over-determined trim capability of ZONA Euler Unsteady Solver (ZEUS), and (ii) the aeroelastic tailoring technique for optimum stiffness distribution and weight minimization while satisfying structural design constraints using ZONA's Automated STRuctural Optimization System (ASTROS). The technical objectives specific to Phase II effort are twofold: (1) Analytically design the four Subsonic Ultra Green Aircraft Research (SUGAR) wind-tunnel models that employ Distributed Multiple Control Surfaces (DMCS) and Variable Camber Continuous Trailing Edge Flap (VCCTEF) to achieve the weight and drag benefits, and (2) Fabrication of one of these four designed models to validate the AAW-process experimentally by a future wind tunnel testing. As per the first specific objective, four wind tunnel models will be designed for high speed Transonic Dynamic Tunnel (TDT) testing along with their detailed fabrication and wind tunnel testing plans. These four models are carefully chosen to incrementally demonstrate the benefits of applying AAW technology and aeroelastic tailoring technique by potential future fabrication and wind tunnel tests. As per the second specific objective, the fabricated wind tunnel model will be delivered to NASA along with its target performance improvement predicted by AAW-process for validation with a near-term wind tunnel testing. In order to ensure the safety of the wind tunnel models during the TDT testing, flutter suppression and gust load alleviation controllers will be designed for those models that are not aeroelastically tailored and have analytically displayed potential flutter instability problems.



Innovative Structural and
Material Concepts for Low-
Weight Low-Drag Aircraft
Design, Phase II

Table of Contents

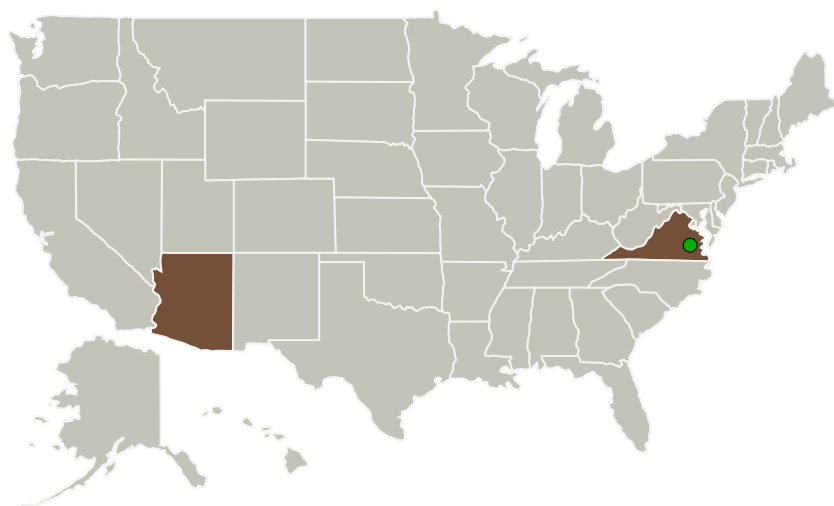
Project Introduction	1
Primary U.S. Work Locations and Key Partners	2
Project Transitions	2
Organizational Responsibility	2
Project Management	2
Images	3
Technology Maturity (TRL)	3
Technology Areas	3
Target Destinations	3

Innovative Structural and Material Concepts for Low-Weight Low-Drag Aircraft Design, Phase II

Completed Technology Project (2014 - 2016)



Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
ZONA Technology, Inc.	Lead Organization	Industry Small Disadvantaged Business (SDB)	Scottsdale, Arizona
● Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations

Arizona	Virginia
---------	----------

Project Transitions

**July 2014:** Project Start

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

ZONA Technology, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Ping-chih Chen

Co-Investigator:

Ping-chih Chen

Innovative Structural and Material Concepts for Low-Weight Low-Drag Aircraft Design, Phase II

Completed Technology Project (2014 - 2016)

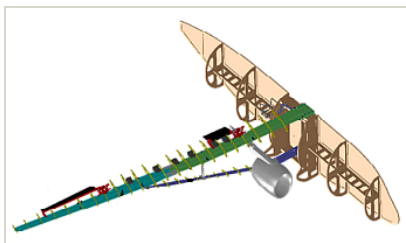


July 2016: Closed out

Closeout Documentation:

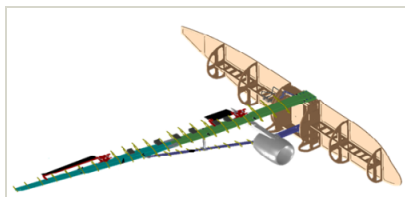
- Final Summary Chart(<https://techport.nasa.gov/file/137449>)

Images



Briefing Chart Image

Innovative Structural and Material Concepts for Low-Weight Low-Drag Aircraft Design, Phase II
(<https://techport.nasa.gov/image/127878>)

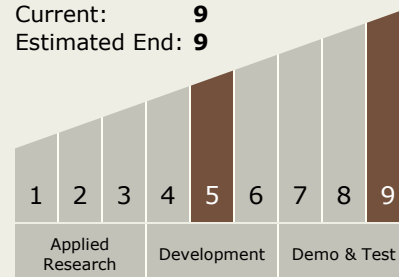


Final Summary Chart Image

Innovative Structural and Material Concepts for Low-Weight Low-Drag Aircraft Design, Phase II Project Image
(<https://techport.nasa.gov/image/132323>)

Technology Maturity (TRL)

Start: 5
Current: 9
Estimated End: 9



Technology Areas

Primary:

- TX15 Flight Vehicle Systems
 - TX15.1 Aerosciences
 - TX15.1.8 Ground and Flight Test Technologies

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System